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NEWS

RSNA Press Release

Brain Imaging with MRI Could Replace Lie Detector

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At A Glance

- Functional magnetic resonance imaging (fMRI) may hold promise as a lie detector.
- fMRI measures changes that occur in the brain when an individual is deliberately deceptive.
- This is the first study to combine fMRI with a traditional polygraph examination to study how the brain works during deception.

CHICAGO - When people lie, they use different parts of their brains than when they tell the truth, and these brain changes can be measured by functional magnetic resonance imaging (fMRI), according to a study presented today at the annual meeting of the Radiological Society of North America. The results suggest that fMRI may one day prove a more accurate lie detector than the polygraph.

"There may be unique areas in the brain involved in deception that can be measured with fMRI," said lead author Scott H. Faro, M.D. "We were able to create consistent and robust brain activation related to a real-life deception process." Dr. Faro is professor and vice-chairman of radiology and director of the Functional Brain Imaging Center and Clinical MRI at Temple University School of Medicine in Philadelphia.

The researchers created a relevant situation for 10 normal volunteers. Six of the volunteers were asked to shoot a toy gun with blank bullets and then to lie about their participation. The non-shooters were asked to tell the truth about the situation. The researchers examined the individuals with fMRI, while simultaneously administering a polygraph exam. The polygraph measured three physiologic responses: respiration, blood pressure and galvanic skin conductance, or the skin's ability to conduct electricity, which increases when an individual perspires.

The volunteers were asked questions that pertained to the situation, along with unrelated control questions. In all cases, the polygraph and fMRI accurately distinguished truthful responses from deceptive ones. fMRI showed activation in several areas of the brain during the deception process. These areas were located in the frontal (medial inferior and pre-central), temporal (hippocampus and middle temporal), and limbic (anterior and posterior cingulate) lobes. During a truthful response, the fMRI showed activation in the frontal lobe (inferior and medial), temporal lobe (inferior) and cingulate gyrus. Overall, there were regional differences in activation between deceptive and truthful conditions.

Furthermore, there were more areas of the brain activated during the deception process compared to the truth-telling condition.

Dr. Faro's study is the first to use polygraph correlation and a modified version of positive control questioning techniques in conjunction with fMRI. It is also the first to involve a real-life stimulus. "I believe this is a vital approach to understand this very complex type of cognitive behavior," Dr. Faro said. "The real-life stimulus is critical if this technique is to be developed into a practical test of deception."

Because physiologic responses can vary among individuals and, in some cases, can be regulated, the polygraph is not considered a wholly reliable means of lie detection. According to Dr. Faro, it is too early to tell if fMRI can be "fooled" in the same manner. However, these results are promising in that they suggest a consistency in brain patterns that might be beyond conscious control.

"We have just begun to understand the potential of fMRI in studying deceptive behavior," Dr. Faro said. "We plan to investigate the potential of fMRI both as a stand-alone test and as a supplement to the polygraph with the goal of creating the most accurate test for deception."

Dr. Faro's co-authors on this paper were Feroze Mohamed, Ph.D., Nathan Gordon, M.S., Steve Platek, Ph.D, Mike Williams, Ph.D., and Harris Ahmad, M.D.

Abstract:	• Functional MRI of Deception and Truth with Polygraph Correlation

Images (.JPG format)

Figure 1. Truth Activation Limbic Lobe(Anterior Cingulate)	**Figure 2.** Truth Activation Frontal LobeInferior Frontal	**Figure 3.** Truth Activation Frontal Lobe Middle Frontal	**Figure 4.** Truth Activation Temporal LobeInferior Temporal
Figure 5. Lie Activation Limbic Lobe(Anterior Cingulate)	**Figure 6.** Lie Activation Limbic Lobe(Posterior Cingulate)	**Figure 7.** Lie Activation Frontal Lobe(Inferior Frontal)	**Figure 8.** Lie Activation Frontal Lobe(Precentral Frontal)
Figure 9. Lie Activation Frontal Lobe(Medial Frontal)	**Figure 10.** Lie Activation Temporal Lobe (Hippocampus)	**Figure 11.** Lie Activation Temporal Lobe(middle temporal)	

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RSNA is an association of more than 37,000 radiologists, radiation oncologists and related scientists committed to promoting excellence in radiology through education and by fostering research, with the ultimate goal of improving patient care. The Society is based in Oak Brook, Ill.